3.6 AIR QUALITY

This section describes local meteorological and air quality conditions and trends. Effects of the Dutch Slough Restoration Project and Related Projects on air pollutant generation and concentrations are calculated. If significant effects may occur, mitigation measures are identified consistent with Bay Area Air Quality Management Agency CEQA implementation guidelines.

3.6.1 AFFECTED ENVIRONMENT

Meteorology

The project sites are located in the City of Oakley, in eastern Contra Costa County, which lies at the eastern edge of the San Francisco Bay Area Air Basin (BAAB). Oakley is located on the south side of the San Joaquin River delta. Its location between the greater Bay Area and the Central Valley has great influence on the climate and air quality of the area.

Temperatures in Oakley average 62°F annually, ranging on the average from the low-40s on winter mornings to the low-90s in late summer afternoons. Daily and seasonal fluctuations in temperature are reduced because of the moderating effects of the nearby ocean. There is, however, a very dramatic difference in summer maximum temperatures in San Francisco (low-70s) versus Brentwood (low-90s).

In contrast to the slowly fluctuating temperature regime, rainfall is highly variable and confined almost exclusively to the "rainy" period from early November to mid-April. Oakley averages 14 inches of precipitation annually, about 4 inches less than communities closer to San Francisco Bay. Because much of the area's rainfall is derived from the fringes of mid-latitude storms, a shift in the annual storm track of a few hundred miles can mean the difference between a very wet year and near-drought conditions.

Oakley has a relatively low potential for air pollution given the persistent and strong winds typical of the area. Wind records from the closest wind-measuring sites show a strong predominance of westerly winds. Daytime wind speeds average 7 – 9 miles per hour. Average wind speed is relatively high and the frequency of calm winds is quite low. These winds dilute pollutants and transport them away from the area so that emissions released in the area have more influence of air quality in the Sacramento and San Joaquin valleys than they do locally. There are, however, several major stationary sources in upwind cities that can influence local air quality and the area's location downwind of the greater Bay Area also means that pollutants from other areas are transported to the Oakley area.

Ambient Air Quality Standards

The Federal Clean Air Act Amendments of 1970 established national ambient air quality standards, and individual states retained the option to adopt more stringent standards and to include other pollution sources. California had already established its own air quality standards when federal standards were established. Because of the unique meteorological problems in the State, there is considerable diversity between State (SAAQS) and national (NAAQS) standards currently in effect in California, as shown in Table 3.6-1.

Table 3.6.1: Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards		Federal Standards		
		Concentration	Method	Primary	Secondary	Method
Ozone (O_3)	1 Hour	0.09 ppm (180 μg/m³)	Ultraviolet Photometry	0.12 ppm (235 μg/m³)	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.07 ppm (140 μg/m³)		0.08 ppm (157 μg/m³)		
Respirable Particulate Matter (PM_{10})	24 Hour	50 μg/m³	Gravimetric or Beta Attenuation	150 μg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 μg/m³		50 μg/m³		
Fine Particulate Matter ($PM_{2.5}$)	24 Hour	No Separate State Standard		65 μg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 μg/m³	Gravimetric or Beta Attenuation	15 μg/m³		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10 mg/m³)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m³)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m³)		35 ppm (40 mg/m³)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m³)		–	–	–
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	(new standard pending)	Gas Phase Chemiluminescence	0.053 ppm (100 μg/m³)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.25 ppm (470 μg/m³)		–		
Lead	30-Day average	1.5 μg/m³	Atomic Absorption	–	–	–
	Calendar Quarter	–		1.5 μg/m³	Same as Primary Standard	High Volume Sampler and Atomic Absorption
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	–	Ultraviolet Fluorescence	0.030 ppm (80 μg/m³)	–	Spectrophotometry (Pararosaniline Method)
	24 Hour	0.04 ppm (105 μg/m³)		0.14 ppm (365 μg/m³)	–	
	3 Hour	–		–	0.5 ppm (1,300 μg/m³)	
	1 Hour	0.25 ppm (655 μg/m³)		–	–	
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer–visibility of 10 miles or more (0.07–30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates	24 Hour	25 μg/m³	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 μg/m³)	Ultraviolet Fluorescence			
Vinyl Chloride	24 Hour	0.01 ppm (26 μg/m³)	Gas Chromatography			

The ambient air quality standards are intended to protect the public health and welfare, and they incorporate an adequate margin of safety. They are designed to protect those segments of the public most susceptible to respiratory distress, known as "sensitive receptors," including asthmatics, the very young, the elderly, people weak from other illness or disease, or persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollution levels somewhat above the ambient air quality standards before adverse health effects are observed.

Air quality is classified according to whether an air-shed meets the applicable standards (“attainment”), does not meet the standard (“non-attainment”), or there is insufficient data to classify the region (“unclassified”). The BAAB is classified with respect to state and/or federal air quality standards as follows:

Table 3.6-2: State and Federal Ambient Air Quality Standards – Attainment Status

Pollutant	Average Time	State AAQS	National AAQS
Ozone	1-hour	Non-attainment	Non-attainment
	8-hour	Unclassified*	Non-attainment**
Carbon Monoxide	1-hour	Attainment	Attainment
	8-hour	Attainment	Attainment
Nitrogen Dioxide	1-hour	Attainment	No Standard
	Annual	Attainment[a]	Attainment
PM-10	24-hour	Non-attainment	Unclassified
	Annual	Non-attainment	Attainment
PM-2.5	24-hour	No Standard	Unclassified
	Annual	Non-attainment	Unclassified

Source: BAAQMD

* recently adopted standard, anticipated to be “non-attainment”

** “marginal” non-attainment classification by EPA

a new standard adopted in 2006

Ambient Air Quality

The Bay Area Air Quality Management District (BAAQMD) operates a regional monitoring network which measures the ambient concentrations of criteria air pollutants: Ozone (O_3), carbon monoxide (CO), inhalable particulate matter (PM-10 and PM-2.5), and nitrogen dioxide (NO2). Existing and probable future levels of air quality in the project area can be best inferred from ambient air quality measurements conducted by the BAAQMD at its Bethel Island Road air monitoring station. Since PM-2.5 is not monitored at either this station or the nearby Pittsburgh station, PM-2.5 data was not included. Table3.6-3 is a five-year summary of monitoring data (2000-2004) from the BAAQMD station.

OZONE (O3)

O_3 is not emitted directly into the atmosphere but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving hydrocarbons (HC) and nitrogen oxides (NOx). O_3 is a regional air pollutant because its precursors are transported and diffused by wind concurrently with O_3 production by the photochemical reaction process. O_3 causes eye and respiratory irritation, reduces resistance to lung infection, and may aggravate pulmonary conditions in persons with lung disease. Table 3.6-3 shows that any exceedance of the state standard has occurred on average two times a year for the past six years. The less stringent federal standard of 0.12 ppm for one hour, has only been exceeded once in the past five years and the federal 8-hour ozone standard have not been violated in the last two years near the project site.

Table 3.6-3: Project Area Ambient Air Quality Monitoring Summary
(Days standard were exceeded and maximum observed concentrations)

Pollutant/Standard	2000	2001	2002	2003	2004
Ozone					
1-Hour > 0.09 ppm (S)	1	3	5	0	1
1-Hour > 0.12 ppm (F)	0	1	0	0	0
8- Hour > 0.08 ppm (F)	1	2	3	0	0
Max. 1-Hour Conc. (ppm)	0.12	0.13	0.11	0.09	0.10
Carbon Monoxide					
1-Hour > 20 ppm (S)	0	0	0	0	0
8- Hour > 9 ppm (S, F)	0	0	0	0	0
Max. 1-Hour Conc. (ppm)	2.3	2.5	1.7	1.6	1.2
Max. 8-Hour Conc. (ppm)	1.5	1.5	1.3	0.9	0.9
Nitrogen Dioxide					
1-Hour > 0.25 ppm (S)	0	0	0	0	0
Max. 1-Hour Conc. (ppm)	0.04	0.04	0.04	0.05	0.03
Inhalable Particulates (PM-10)					
24-Hour > 50 μg/m3 (S)	2/61	4/61	3/61	1/61	0/61
24-Hour > 150 μg/m3 (F)	0/61	0/61	0/61	0/61	0/61
Max. 24-Hour Conc. (□g/m3)	65	92	61	51	42

Source: Bay Area AQMD – Bethel Island Road Air Monitoring Station.

CARBON MONOXIDE (CO)

CO is an odorless, invisible gas usually formed as the result of incomplete combustion of organic substances. Approximately 80 percent of the CO emitted in the Bay Area comes from on-road motor vehicles (BAAQMD). High levels of CO can impair the transport of oxygen in the bloodstream and thereby aggravate cardiovascular disease and cause fatigue, headaches, and dizziness. Table 3.6-3 shows that no exceedances of state CO standards were recorded between 1996 and 2001. Measurements of carbon monoxide (CO) show low baseline levels with the hourly and 8-hour maximum never exceeding the allowable state or federal standards for the past five years. The maximum 1-hour and 8-hour concentrations seem to be declining.

RESPIRABLE PARTICULATE MATTER (PM-10)

PM-10 consists of inhalable particulates that can cause adverse health effects. PM-10 can include certain substances, such as sulfates and nitrates, that can cause lung damage directly, or can contain absorbed gases (e.g., chlorides or ammonium) that may be injurious to health. Table 3.6-3 shows that exceedances of the state PM-10 standard occur relatively infrequently in the project vicinity. State PM-10 standards were exceeded about 3 percent of the time and Federal PM-10 standards have never been exceeded at the Bethel Island air monitoring station.

In July 1997, the U. S. Environmental Protection Agency adopted an 8-hour ozone standard, and a new standard for PM-2.5, which represents the fine fraction of inhalable particulate matter. California has adopted an annual average state standard for PM-2.5 that is more stringent than the federal annual average standard. The SAAQS for PM-2.5 went into effect in July 2003.

These new standards were challenged in federal court as a "states rights" issue. A stay on implementation of the standards was issued. The U.S. Supreme Court heard the appeal filed by the Dept. of Justice on behalf of EPA. In a unanimous decision, the Supreme Court ruled in February, 2001, that the EPA did indeed have the proper authority to adopt national clean air standards, and that a cost versus benefit analysis need not accompany such new rules. However, the court ruled that attainment schedules for new standards were inconsistent with those from "older" standards, and that new schedules must be prepared. EPA signed a consent decree to revise the ozone attainment classification of a number of air basins based upon the 8-hour standard, and to begin an attainment planning process for the federal PM-2.5 standard. The Bay Area Air Basin is designated a "marginal" non-attainment area for the 8-hour ozone standard. Although there are no air monitoring stations in the project area which measure PM-2.5, the project area likely has few violations of the standard. Although some parts of the basin have air quality that is not as good as in the Oakley area, few federal clean air standards have been exceeded in the project area in almost a decade.

GREENHOUSE GASES

Gases that trap heat in the atmosphere are often called greenhouse gases (GHG). Common GHG include water vapor, carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, ozone , and aerosols. GHG are emitted by both natural processes and anthropogenic (human-caused) sources. The accumulation of GHG in the atmosphere increases the earth's temperature over time (global warming). GHG emissions from human activities, such as fossil fuel combustion for electricity generation and vehicle use, have elevated the concentration of these gases in the atmosphere, thus contributing significantly to global warming (California Association of Environmental Professionals [AEP] 2007).

Listed below are the principal greenhouse gases that enter the atmosphere from human activities, and their primary anthropogenic and natural sources. Also included are the percent contributions of each to total U.S. anthropogenic GHG emissions (EPA 2008 http://www.epa.gov/climatechange/emissions/usinventoryreport.html).

- Carbon dioxide, CO2. Natural sources include volcanic eruptions, diffusion from oceans, fires, and respiration by and decay of biological organisms. The primary anthropogenic source of CO2 is combustion of fossil fuels (oil, natural gas, and coal); it accounts for approximately 94% of CO2 emissions. In 2006, CO2 accounted for 85% of all US anthropogenic GHG emissions. CO_2 is removed from the atmosphere (or sequestered) when it is used by plants during photosynthesis or absorbed by seawater.

- Methane, CH_4. Anthropogenic sources include fossil fuel production, animal husbandry (digestion of feed by livestock, manure management), and solid waste and wastewater management. In 2006, CH_4 accounted for 8% of all US anthropogenic GHG emissions. Natural sources of methane include wetlands (such as tidal marshes), oceans and fresh water bodies, non-wetland soils, wildfires, and other sources.
- Nitrous oxide, N_2O. The primary natural sources are biological processes in soil and water. It is also emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. A significant local source of N_2O is the drying and disking of Delta peat soils. In 2006, N_2O accounted for 5% of all US anthropogenic GHG emissions.
- Fluorinated gases: Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are often used as substitutes for ozone-depleting substances (i.e., chlorofluorocarbons, hydrofluorocarbons, and halons). These gases typically are emitted in smaller quantities (2% of all 2006 US anthropogenic GHG emissions), but because they are potent greenhouse gases, they are sometimes referred to as High Global Warming Potential gases ("High GWP gases") (USEPA 2006).

The greenhouse gas of most concern is CO_2 because it is the most common, can last in the atmosphere for centuries, and "forces" more climate change than any other greenhouse gas. CO_2 is the standard for GHG, and the effect of all other GHG gases are transformed into 'CO_2 equivalents', which is a common measure used to report total GHG emissions.

In 2004 (and most years), CO_2 accounted for 85% of the greenhouse gas emissions produced in the United States. Approximately 6.65 billion short tons[1] of CO_2 were emitted in the United States in 2004 from all sources. The California Energy Commission (CEC) has estimated that in 2004, the state emitted 542 million short tons of CO_2 equivalent GHG emissions (CEC 2006 Report), which is about 8% of the national total.

Regulatory Framework

FEDERAL STANDARDS

The 1977 Clean Air Act required that regional planning and air pollution control agencies prepare a regional Air Quality Plan to outline the measures by which both stationary and mobile sources of pollutants can be controlled in order to achieve all standards within the deadlines specified in the Clean Air Act. For the Bay Area Air Basin (BAAB), the Association of Bay Area Governments (ABAG), the Metropolitan Transportation Commission (MTC), and the BAAQMD jointly prepared a Bay Area Air Quality Plan in 1982, which predicted attainment of all federal clean air standards within the basin by 1987. This forecast was somewhat optimistic in that attainment of federal clean air standards did not occur throughout the entire air basin until 1991.

In 1995, after several years of minimal violations of the federal one-hour ozone standard, the U.S. Environmental Protection Agency (EPA) revised the designation of the BAAB from "non-

[1] A short ton is 2,000 pounds, as opposed to the metric ton which is 2,204 pounds.

attainment" to "attainment" for this standard. However, with less favorable meteorology in subsequent years, violations of the national ozone standard were again observed in the basin. Effective August 1998, the EPA downgraded the Bay Area's classification for this standard from a "maintenance" area to an "unclassified non-attainment" area. Because the federal ozone standard was not met by 2001 as required under interim designations, a new federal attainment plan was imposed upon the air basin. With redesignation of the basin as "marginal non-attainment" for the 8-hour ozone standard, the planning process for federal standards will convert from the one-hour to the 8-hour standard with little difference in the actual attainment strategy. In 1998, after many years without violations of any carbon monoxide (CO) standards, the attainment status for CO was upgraded to "attainment."

STATE STANDARDS

In 1988, California passed the California Clean Air Act (AB-2595) which, like its federal counterpart, called for designations of areas as attainment or non-attainment, based on state Ambient Air Quality Standards rather than federal or national standards.

The 1988 California Clean Air Act (CCAA) also required development of air quality plans and strategies to meet state air quality standards in the Bay Area. The Bay Area 1991 Clean Air Plan (1991 CAP) included a comprehensive strategy to reduce air pollutant emissions and focused on control measures to be implemented during the 1991 to 1994 period. It also included control measures to be implemented from 1995 through 2000 and beyond. The Bay Area 1994 Clean Air Plan (1994 CAP) included changes in the organization and scheduling of some 1991 CAP measures and also included eight new stationary and mobile source control measures. The 1994 CAP covered the period from December 1994 to 1997. Based on revisions to the 1994 CAP, the 1997 CAP was updated and adopted December 17, 1997. The 1997 CAP contains every control measure deemed feasible for implementation as required by state law. Even with all reasonable and feasible measures, the 1997 CAP did not predict near-term attainment of the state ozone standard.

For state air quality planning purposes, the Bay Area is classified by the CCAA as a serious non-attainment area for ozone. The serious classification triggers various plan submittal requirements and transportation performance standards. One such requirement is that the Bay Area update the CAP every three years to reflect progress in meeting the air quality standards and to incorporate new information regarding the feasibility of control measures and new emission inventory data. The most recent update of the attainment plan for meeting the state ozone standard was completed in 2005, and adopted by the Governing Board of the BAAB in January, 2006. This plan includes various elements such as climatic change/global warming, fine particulate matter, and the Community Air Risk Evaluation (CARE) program. The 2005 plan includes land use strategies that promote smart growth and enhance public transit opportunities. Because the proposed project generates minimal new traffic, the project is believed to be consistent with clean air planning objectives.

The California Air Resources Board (ARB) is the state agency responsible for regulating air quality. ARB responsibilities include establishing State Ambient Air Quality Standards, emissions standards and regulations for mobile emissions sources (e.g., autos, trucks, etc.), and overseeing the efforts of county-wide and multi-county air pollution control districts, which have primary responsibility over stationary sources. The Bay Area Air Quality Management District (BAAQMD) is the regional agency responsible for air quality regulation within the San Francisco BAAB. The BAAQMD regulates air quality through its permit authority over most types of stationary emission sources and through its planning and review activities. The BAAQMD. AMBAG and the MTC are co-lead agencies in developing regional air quality attainment plans to meet state and federal air quality improvement mandates.

GREENHOUSE GASES

The California Legislature has determined that global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California (Health and Safety Code Section 38501). The Global Warming Solutions Act of 2006 (AB 32) codifies California's goal of reducing statewide emissions of greenhouse gases (GHG) to 1990 levels by 2020. This reduction will be accomplished through an enforceable statewide cap on global warming emissions that will be phased-in starting in 2012 to achieve maximum technologically feasible and cost-effective GHG emission reductions. In order to effectively implement the cap, AB 32 directs the California Air Resources Board (CARB) to develop appropriate regulations and establish a mandatory reporting system to track and monitor global warming emissions levels. As part of AB 32, CARB is currently proposing to adopt a number of Early Actions. One Early Action would reduce emissions from diesel trucks, which are responsible for 7.5% of California's global warming pollution. The proposed "Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Measure" would require trucks to reduce emissions through retrofits or upgrades to newer trucks.

In 2007, the California legislature passed legislation (Senate Bill 97) amending CEQA to specifically establish that GHG emissions and their impacts are appropriate subjects for CEQA analysis. SB 97 requires the Governor's Office of Planning and Research (OPR) to prepare guidelines for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions by July 2009 and that these guidelines be certified and adopted by the Resources Agency by January 2010. On June 19, 2008, OPR issued a Technical Advisory entitled "CEQA and Climate Change: Addressing Climate Change Through California Environmental Quality Act (CEQA) Review." That technical advisory recognizes the lack of statewide thresholds of significance for GHG emissions and states that OPR has asked the CARB to recommend a method for setting thresholds that will encourage consistency in CEQA analyses. Until uniform guidelines are in place, OPR recommends that each CEQA lead agency establish its own approach to analyzing climate change from projects that generate GHG emissions. Three steps – quantifying emissions, assessing the significance of the impact on climate change, and identifying alternatives or mitigation measures – are recommended by OPR.

3.6.2 IMPACTS AND MITIGATIONS

Criteria of Significance

The California Environmental Quality Act (CEQA) Appendix G Guidelines includes a number of tests of potential air quality impact significance. Although CEQA does not allow the Lead Agency to defer its decision and findings to another agency, it does encourage the use of significance criteria established by a responsible or commenting agency with expertise in air quality.

In the BAAB, the BAAQMD has developed numerical significance criteria, or has provided technical guidance for significance evaluation, in its "BAAQMD CEQA Guidelines" (1996, revised December 1999). These thresholds of significance are recommended for use in assessing impacts associated with construction, project operations, odors, toxic air contaminants, accidental releases, cumulative impacts and regional planning projects/programs associated with project implementation.

The Air District guidelines are designed to identify those impacts that would create new violations of ambient air quality standards, substantially worsen existing violations, or create impacts for which no safe exposure levels exist. Because many air quality impacts require additional photochemical transformation after atmospheric release, individual project impacts are diluted to an immeasurably small increment. The BAAQMD has therefore adopted emission levels that are considered as contributing to a substantial increase even if the ambient air quality increment itself is undetectable. Emissions based significance criteria for operational emissions are as shown on Table 3.6-4.

Table 3.6-4: Emissions Based Significance Criteria For Operational Emissions

Pollutant	Ton/Year	Lb/Day
ROG	15	80
NOx	15	80
PM-10	15	80

If daily CO emissions exceed 550 lb/day, or project vicinity intersections operate at Levels of Service of D, E or F (see Traffic section for local intersection operation levels), or the project adds more than 100 vehicles per hour and increases volumes by 10 percent at any intersection or roadway segment, a micro-scale impact analysis is recommended to assess CO "hot spot" potential.

Temporary construction activity may impact air quality, but such impacts are highly variable from day-to-day or project-to-project. They are difficult to quantify accurately. The primary focus of any construction activity impact assessment is from particulate matter (PM-10). Exhaust emissions from heavy equipment may also be generated during construction. The BAAQMD CEQA Guidelines suggest that equipment exhaust emissions have been integrated into the regional are quality plan as part of overall growth and are mainly a regional air quality issue.

No state or federal agency has yet established significance criteria (thresholds of significance) for GHG or other impacts to global climate change. Neither has DWR established its own protocols for analyzing project-generated GHG emissions or set thresholds of significance. Policies have not been set, in part, because the science required to do so has not been fully developed. Although estimates have been made at the national and state levels for types of emissions and their sources, we do not yet know how to accurately measure GHG emissions for small projects. Although we can identify most of the factors contributing project emissions, we cannot yet reliably quantify them. However, given the current state of the science, it is believed that habitat restoration projects such as the Dutch Slough or Ironhouse projects, which result in a change in current practice from grazing or agriculture to tidal marsh, contribute very little, if any, GHG emissions. As addressed herein, the primary GHG contributions from the Dutch Slough Tidal Marsh Restoration project are short term and temporary, resulting from the construction of the project.

We did not attempt to measure a baseline for GHG emissions from the current land use of the project site, but assume that there is a net emission of GHG. The following are current GHG sources for the project site:

- CH4 from beef cattle and their manure
- N2O from drained peat soils

- CO_2 from combustion of fossil fuels (vehicles, heavy equipment, pumps)
- CO_2 and N_2O from disking and ground disturbance

There are approximately 70 acres of permanent freshwater wetlands on the project site. USGS research has indicated that such wetlands are net carbon sinks (Robin Miller pers comm. 2008). However because we cannot quantify the GHG sources, it is not known if the wetland sequestration is sufficient to offset GHG emissions from the site.

Alternative 1: Minimum Fill

IMPACT 3.6.1-1: VEHICULAR EMISSIONS (ALL OPTIONS)

Restoration of the Dutch Slough and Ironhouse parcels, and development of the City Community Park would generate a limited amount of additional traffic. The three projects would generate an additional 125 daily trips for educational, recreational and passive visitor traffic; most of these trips would be associated with the park uses, with lesser traffic generated by the two restoration projects. Emissions generated from such a small volume of traffic are negligible compared to the BAAQMD thresholds seen as shown in Table 3.6-5. As can be seen in that table, regional air quality impacts are shown above to be negligible. No mitigation is required.

Table 3.6-5: Emissions Based Significance Criteria For Vehicular Emissions

Pollutant	Project Emissions (lbs/day)	BAAQMD Threshold (lbs/day)
Reactive Organic Gases	1.0	80
Nitrogen Oxides	1.4	80
Carbon Monoxide	17.8	n/a
Particulate Matter	0.1	80

Source: EMFAC2002 Computer Model, Year = 2008

IMPACT 3.6.1-2: CONSTRUCTION EMISSIONS (ALL OPTIONS)

Any impact potential would derive from short-term demolition and construction emissions, particularly from fugitive dust (PM-10). Because of the difficulty in quantifying daily construction dust emissions, the air district guidelines are more oriented toward effective mitigation of PM-10 rather than precise quantification. The BAAQMD has therefore developed a menu of mitigation measures that, if fully implemented, are presumed to achieve a less-than-significant air quality impact. The range of mitigation measures includes a set of “Basic Control Measures,” and a set of "Enhanced Control Measures" if the project construction area exceeds 4.0 acres. Potential emissions of hazardous materials from demolition of buildings are addressed in Section 3.15, Hazards and Hazardous Materials.

Equipment exhaust is not considered a significant regional emissions source at any individual construction project (BAAQMD CEQA Guidelines, 1996). However, the diesel-powered equipment would release carcinogenic particulate emissions for which there is no safe exposure level. Risk assessments for a variety of construction projects have demonstrated, however, that the combined effects of limited construction duration, very good daytime ventilation in the Oakley area and the absence of many existing neighbors during daytime construction hours all serve to not measurably increase lifetime individual cancer risk beyond *de minimis* levels. Therefore this impact would be less than significant.

MITIGATION 3.6.1-2: ENHANCED DUST-CONTROL PROGRAM (ALL OPTIONS)

Because the proposed project is more than 4.0 acres, implementation of an enhanced dust control program during construction is recommended to achieve a less-than-significant dust nuisance impact. The list of suggested PM-10 mitigation measures is included in Table 3.6-6.

Table 3.6-6: Control Measures for Construction Emissions of PM-10
Basic Control Measures (Required) *The following controls will be implemented:* • Water all active construction areas at least twice daily. • Cover all trucks hauling soil, sand, and other loose materials or require all truck to maintain at least 2 feet of freeboard. Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites. • Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets. **Enhanced Control Measures (Recommended because large scale of grading)** The following additional measures are recommended to be implemented at this construction site: • Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.). • Limit traffic speeds on unpaved surfaces to 15 mph. • Install sandbags or other erosion control measures to prevent silt runoff to public roadways. • Replant vegetation in disturbed areas as quickly as possible.

Significance after Mitigation: Less than Significant

IMPACT 3.6.1-3: GREENHOUSE GAS EMISSIONS (ALL OPTIONS)

The Dutch Slough Restoration Project and Related Projects would contribute to GHG primarily through the use of diesel-powered construction equipment. There would be no net long-term emissions (permanent sources) of GHG from the Dutch Slough or Ironhouse Project. The combustion of diesel fuel in off-road construction equipment and on-road vehicles (trucks, etc.) would emit greenhouse gases consisting mainly of carbon dioxide (CO2), along with small amounts of methane (CH4) and nitrous oxide (N2O).

DWR staff estimated the emissions-based carbon footprint for the construction of the Dutch Slough Restoration Project using:

- estimated number of anticipated workers needed for construction, their average commute distance, and associated fuel consumption;

- estimated construction equipment needed, their fuel consumption, and total hours of operation;
- estimated number of days for construction;
- estimated volumes of imported fill and on-site grading and cut-and-fill.

Using this methodology, the estimate for construction-related emissions for Alternative 1 is 245 metric tons of CO2-equivalent. Methods used for this estimate can be found in Appendix E. It is estimated that it would take approximately ten acres of mature tule marsh to sequester this much carbon in one year (see below).

While emissions will be created through the operation of construction and earth moving machinery, wetland restoration projects such as the Dutch Slough Restoration Project are expected to become long-term carbon sinks, eventually offsetting emissions from all associated vehicular traffic and short term operation of construction equipment. Further, the cessation of agricultural activities would eliminate current GHG sources such as vehicle traffic, cattle grazing, and pump operation.

Vegetation in wetlands can capture carbon by taking in atmospheric CO2, converting it to plant mass through photosynthesis, and then sequestering the carbon in the inundated soils that form as plant matter decomposes. Pilot studies being undertaken in mature tule marshes on Twitchell Island have found a very high primary productivity (carbon fixation) and sequestration of below-ground carbon (C-immobilization, or long term "storage") that would remain stable. On the other hand, wetlands can release greenhouse gases, including methane, under certain conditions. To address these uncertainties, DWR and USGS have initiated research on the processes that affect the carbon cycle in re-establishing wetlands. This research, being conducted on a farm-scale wetland on Twitchell Island, will attempt to more accurately quantify biogeochemical processes and net GHG. In addition, the California Climate Action Registry is underwriting the development of research to help quantify the GHG balance in tidally-influenced wetland systems.

Recent research has indicated that in mature tule marshes as much as 25 metric tons of carbon per acre per year may be sequestered, and that as much as 0.5 metric tons of carbon per acre per year may be produced as methane (Robin Miller pers comm.). These results are widely variable depending upon many factors such as temperature, inundation regime, and plant species.

For the Dutch Slough Restoration Project, there will be open water, intertidal vegetated wetlands, channels, riparian areas, and uplands. Acreage of intertidal wetlands vary between the alternatives and options (see Table 2-1), but range between approximately 200 and 800 acres for Alternative 1, and approximately half of that area is expected to develop into tule marsh capable of sequestering significant amounts of carbon. All the open water and wetland areas are expected to release methane, though at varying rates depending upon plant type and cover. There will be roughly 500-800 acres of these habitats. Rates of sequestration and emission depend upon many factors, including plant species, depth and duration of inundation, and the age of the wetlands. There are too many variables to accurately estimate the amount of carbon the mature wetlands will sequester, but based on the Department's most current understanding of these systems, the restored wetlands are anticipated to be a net carbon sink.

Because the construction-related emissions will be temporary, and the project is expected to be a net carbon sink, no mitigation is required.

It should be noted that sea level rise could potentially increase or decrease carbon fixation and sequestration, depending on the rate of sea level rise. Gradual sea level rise keeps tule marshes productive and peat (and sequestered carbon) buried. Rapid sea level rise could drown tule marsh, make sediment more mobile, and increase tidal energy and erosion, mobilizing sequestered carbon. This uncertainty does not change the conclusion that the long-term impact of project GHG emissions is considered less than significant and no mitigation is required.

MITIGATION 3.6.1-3.1: BEST MANAGEMENT PRACTICES TO REDUCE GREENHOUSE GAS EMISSIONS (ALL OPTIONS)

Construction crews will be required to follow BMPs for reduction of emissions, such as limits on idling, keeping engines in tune, and possibly retrofits to increase fuel efficiency. These BMPs will be included in worker environmental education sessions. All measures in the CARB "Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Measures" will also be adhered to if the measures have been instituted by the time construction starts.

MITIGATION 3.6.1-3.2: OPEN WATER AREAS MANAGED FOR CARBON SEQUESTRATION

If future research (prior to project implementation) shows that the restored wetlands are likely to sequester significantly less carbon than current estimates, the open water areas will be designed to be managed for maximum carbon sequestration.

Alternative 2: Moderate Fill Alternative

IMPACT 3.6.2-1: VEHICULAR EMISSIONS (ALL OPTIONS)

The moderate fill alternative would generate the same level of operational trips at project conclusion as Alternative 1. Long-term operational impacts would be similarly less-than-significant. No mitigation is required.

IMPACT 3.6.2-2: CONSTRUCTION EMISSIONS (ALL OPTIONS)

Temporary construction activity impacts would be substantially greater because more heavy equipment will be required to operate on a much larger footprint. Project earthworks for this alternative are estimated at 1,320,000 cubic yards (including activities on all three project sites). Both the larger area disturbed, and the greater amount of fill material handled, will increase temporary dust generation. PM-10 impacts would be minimized by utilization of best management practices outlined in Table 3.6-6. They would also be minimized by prevailing meteorology that carries dust eastward during the day toward lightly developed areas rather than westward toward heavier concentrations of residential use.

The bulk of the fill material is presumed to be available from on-site borrow areas that would be excavated to restore the tidal marsh. The material would likely be somewhat damp and thus less given to fugitive dust generation. Damp material may, however, create odors from biological decay. Some volatile organic compounds (VOC) could be released from buried petroleum wastes. As described in Section 3.15, Hazards and Hazardous Materials, and in Mitigation 3.6-3, below, prior to any final conclusions on the use of possible on-site fill material resources, the candidate material would be tested for low biological and chemical content that would prevent the release of odorous or toxic materials associated with on-site borrow/fill transfer.

Material transfer would likely be accomplished by self-loading scrapers after a ripper-hook dozer loosens the material. Compactors would operate on the receiving end to spread and layer the fill. At peak transfer operations, a fleet of perhaps 20 pieces of equipment may be operating on-site. Daily emissions associated with 20 scrapers, as the dominant equipment source, are as follows (lbs/day):

Reactive Organic Gases - 72.8

Carbon Monoxide - 336.2

Nitrogen Oxides - 322.3

Particulate Matter (PM-10) - 17.1

BAAQMD CEQA guidelines state that regional impacts from temporary construction activities can be considered less-than-significant because they have been accounted for in the regional emissions inventory, and are thus not "new" sources. However, the non-attainment status of the air basin for ozone, and the carcinogenic nature of diesel exhaust, requires that all reasonably available control measures for equipment exhaust be incorporated as impact mitigation.

MITIGATION MEASURE 3.6.2-2.1: TEST FILL MATERIALS FOR VOC (ALL OPTIONS)

A portion of all candidate fill material from borrow sites shall be tested to confirm its suitability in terms of very low VOC levels and low biological content that could create emissions of toxic or odorous materials during on-site cut/fill operations.

MITIGATION MEASURE 3.6.2-2.2: USE REDUCED NOX SCRAPERS (ALL OPTIONS)

During the contractor selection process, preference shall be given to any grading contractor that guarantees to provide scrapers that emit 20 percent less NOx and 45 percent less PM-10 than the statewide average for the same equipment.

Significance after Mitigation: Less than Significant

IMPACT 3.6.2-3: GREENHOUSE GAS EMISSIONS (ALL OPTIONS)

These impacts would be similar, though quantitatively larger, to those described for alternative 1, above. Using the same methodology used in Impact 3.6.1-3, the estimate for Alternative 2 is 850 metric tons of CO_2-equivalent.

Acreage of intertidal wetlands vary between the alternatives and options, but roughly range between 400 and 900 acres for Alternative 1, and approximately half of that area is expected to develop into tule marsh capable of sequestering significant amounts of carbon. All the open water and wetland areas are expected to release methane, though at varying rates depending upon plant type and cover. There will be roughly 600-900 acres of these habitats. Rates of sequestration and emission depend upon many factors, including plant species, depth and duration of inundation, and the age of the wetlands. There are too many variables to accurately estimate the amount of carbon the mature wetlands will sequester, but based on the Department's most current understanding of these systems, the restored wetlands are anticipated to be a net carbon sink, no mitigation is required.

Alternative 3: Maximum Fill

IMPACT 3.6.3-1: VEHICULAR EMISSIONS (ALL OPTIONS)

Operational air quality impacts would be identical to Alternatives 1 and 2 because the number of visitor vehicles is unchanged. No significant impacts would occur.

IMPACT 3.6.3-2: CONSTRUCTION EMISSIONS (ALL OPTIONS)

Implementation of this alternative would entail the placement of 3,200,000 cubic yards of fill. Off-site fill resources would need to be trucked to the site. Construction impacts and mitigation would be identical to Alternative 2, except that this alternative would additionally include on-road trucking activity emissions.

A daily hauling scenario of 250 loads of fill per day, traveling perhaps 20 miles round trip per load, has been assumed. The additional on-road emissions from this hauling scenario, above the on-site equipment emissions that may occur simultaneously, are calculated as follows for 10,000 on-road truck miles (lbs/day):

Reactive Organic Gases - 14

Nitrogen Oxides - 159

Carbon Monoxide - 135

Particulate Matter - 5

As with the on-site equipment emissions, temporary trucking emissions are not considered to have an individually significant air quality impact. Trucks may have a possible cumulative impact by increasing ozone precursor emissions, by contributing to diesel exhaust particulate matter, and by competing with existing traffic in developed areas for available roadway capacity.

MITIGATION MEASURE 3.6.3-2: MINIMIZE IMPORTED FILL TRUCK TRAVEL (ALL OPTIONS)

In addition to a requirement for inclusion of Mitigation Measures 3.6.2-2.1 and 3.6.2-2.2 in this alternative, the following additional mitigation measure is recommended for this alternative:

Imported fill shall be obtained from locations that minimize truck travel through incorporated portions of the City of Oakley.

Significance after Mitigation: Less than Significant.

IMPACT 3.6.3-3: GREENHOUSE GAS EMISSIONS (ALL OPTIONS)

The type of impacts would be similar to those described for alternative 1, above, but the GHG emissions would be larger. No estimate of GHG emissions was made for Alternative 3 because a source for the required 1.5 million cubic yards of fill has not been identified, so haul distances could not be estimated with any degree of certainty. However, it is assumed that the carbon emissions from Alternative 3 would be at least 1,640 metric tons of CO_2-equivalent, or twice the emissions of Alternative 2.

Acreage of intertidal wetlands vary between the alternatives and options, but roughly range between 500 and 900 acres for Alternative 1, and approximately half of that area is expected to develop into tule marsh capable of sequestering significant amounts of carbon. All the open water and wetland areas are expected to release methane, though at varying rates depending upon plant type and cover. There will be roughly 600-900 acres of these habitats. Rates of sequestration and emission depend upon many factors, including plant species, depth and duration of inundation, and the age of the wetlands. There are too many variables to accurately estimate the amount of carbon the mature wetlands will sequester, but based on the Department's most current understanding of these systems, the restored wetlands are anticipated to be a net carbon sink, notwithstanding the larger construction-related emissions in this Alternative. No mitigation is required.

Alternative 4: No Project

No air quality impacts would derive from selection of this alternative.